REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 1-46 are presented for consideration. Claims 1-15 and 17-30 have been cancelled without prejudice or disclaimer of subject matter. Claims 33-46 have been added to assure Applicant of the full measure of protection to which he deems himself entitled. Support for the added claims can be found in the original application, as filed. Therefore, no new matter has been added. Claims 16, 31, 33 and 39 are independent. Claims 16, 31 and 32 have been allowed. Claims 33 and 39 are the only independent claims under consideration.

The specification and the abstract have been carefully reviewed and amended as to matters of form. The specification and the abstract have been amended to correct typographical errors and to improve idiomatic English. No new matter is believed to have been added.

Cancelled Claims 1-3, 8, 9, 11, 12, 14, 17-19, 24, 25, 27, 28 and 30 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,262,792 (Higashiki). Cancelled Claims 1, 4, 5, 15, 17, 20 and 21 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,304,316 (Jain et al.). Cancelled Claims 1-3, 11, 12, 14, 17-19, 27 and 28 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,549,271 (Yasuda et al.). Cancelled Claim 30 was rejected under 35 U.S.C. § 103 as being unpatentable over the Higashiki patent as applied to claim 1 above and further in view of U.S. Patent No. 6,228,561

(Hasebe et al.). With regard to newly added Claims 33-46, these rejections are respectfully traversed and Applicant requests favorable reconsideration and withdrawal of the objection and rejections set forth in the above-noted Office Action.

Newly added independent Claim 33 is directed to an exposure method that transfers a pattern onto a substrate while moving an element concerning the transfer. According to the method, a second pattern is transferred onto the substrate onto which a first pattern has been transferred while moving the element based on information prepared with respect to each position of the element for correcting an overlay error between the first and second patterns.

In Applicants' view, Higashiki discloses an optical exposure apparatus of a scan-exposure system in which scan-exposure is preliminarily executed before an actual scan-exposure and a reticle position measuring device measures a positional change of a reticle in the upper and lower direction with the movement of a reticle stage to a scanning direction. Then, a calculation circuit obtains correction data for an offset based on the measuring value to be stored in a memory. Thereafter, correction data stored in the memory is sequentially supplied to a feedback controlling circuit at an actual scan-exposure time. Also, a measuring value of the position of a wafer in a Z-axial direction with the movement of the wafer stage to the scanning direction, relatively moving with the reticle stage, is supplied to the feedback controlling circuit from a wafer position measuring device. The feedback controlling circuit controls a wafer Z-axial driving mechanism such that the position of the wafer in the Z-axial direction is offset by a positional change of the reticle in upper and lower directions. Thereby, correcting a shift of a projection image from a

focal position at an exposure surface on the wafer due to deformation (curve and tilt) of the reticle and the upper and lower movement.

According to the invention of newly added Claim 33, a second pattern is transferred onto a substrate that has had a first pattern transferred to it while moving an element concerning the transfer. The movement of the element is based on information prepared with respect to each position of the element for correcting an overlay error between the first and second patterns.

Higashiki discloses an arrangement in which correction information for the deformation of a reticle is prepared and used to correct the movement of a pattern transfer element. It is a feature of Claim 33 that an element movement in transferring a second pattern onto a substrate after transfer of a first pattern onto the substrate is based on information prepared with respect to each position of the element for correcting an overlay error between the first and second patterns. It is not seen that Higashiki's use of correction information of deformation of a reticle in any manner relates to control of movement of an element of pattern transfer during the transfer of a second pattern onto a substrate to which a first pattern has been previously transferred based on overlay error correction information prepared for each position of an element as in Claim 33. Accordingly, it is believed that newly added Claim 33 is completely distinguished from Higashiki.

In Applicants' opinion, Jain et al. discloses a projection microlithography system that can pattern very large, curved substrates at very high exposure speeds and any desired image resolution. The substrates are permitted to have arbitrary curvature in two dimensions. The substrate is held rigidly on a scanning stage, on which is also mounted a mask containing the pattern to be formed on the substrate. The mask is imaged on the substrate by a projection

subsystem which is stationary and situated above the scanning stage. The mask is illuminated with a polygonal illumination beam which causes a patterned region of similar shape to be imaged on the substrate. Different regions of the substrate are moved in a direction parallel to the direction of the optical axis at the substrate (z-axis) by suitable amounts to keep the segment being exposed within the depth of focus of the imaging lens. The stage is programmed to scan the mask and substrate simultaneously across the polygonal regions so as to pattern the whole mask. Suitable overlap between the complementary intensity profiles produced by the polygonal illumination configuration ensures seamless joining of the scans. This microlithography system includes opto-mechanical mechanisms that dynamically sense the substrate height at each point, to move the substrate in the z-dimension, and/or configure the focal plane of the projection subsystem so as to always keep the substrate region being exposed within the depth of focus of the projection subsystem.

Jain et al. discloses a system in which a surface profiler determines the shape of a substrate which shape information is used by a controller to determine correction information. The controller operates based on the correction information provided by the profiler to configure the focal plane of the projection system to keep the substrate region being exposed within the depth of focus of the projection system. As a result, Jain et al. is limited to teaching moving an element of a pattern transfer based only on the shape characteristics of a substrate. Such shape characteristic of a substrate used to keep a substrate region being exposed within a depth of focus, however, is completely distinguished from information prepared with respect to each position of an element for correcting an overlay error between first and second patterns in the element movement for

transfer of the second pattern onto a substrate subsequent to the transfer of a first pattern to the substrate as in Claim 33. It is therefore believed that newly added Claim 33 is completely distinguished from Jain et al..

Yasuda et al., in Applicants' view, discloses a projection exposure method that exposes a substrate through a projection optical system with a predetermined pattern formed on a mask. According to the method, an amount of lateral variation of a pattern image in a direction perpendicular to an optical axis of the projection optical system is calculated. A distortion produced solely by the projection optical system is determined. A total expected distortion by a summation of the distortion produced solely by the projection optical system is obtained and the calculated variation of the positions at which the image of the pattern of the mask is formed. The substrate is exposed while partially correcting the positions at which the image of the pattern of the mask is formed through the projection optical system based on the total expected distortion.

Yasuda et al. may teach determining the total expected distortion by summing the amount of lateral variation of a pattern image perpendicular to an optical axis of a projection optical system and the distortion produced by the projection optical system and exposing a substrate while correcting the positions at which the image of the mask pattern is formed through the projection optical system based on the total expected distortion. Accordingly, Yasuda et al. is restricted to teaching moving an element of a pattern transfer based on the lateral variations of the mask pattern and distortion of the projection optical system. In contrast to Yasuda et al.'s element movement based on shape characteristics of a mask pattern, it is a feature of Claim 33 that the moving of an element of a pattern transfer of a second pattern to a substrate on which a first

pattern has already been transferred is based on information prepared with respect to each position of the element for correcting an overlay error between the first and second patterns. It is therefore believed that newly presented Claim 33 is completely distinguished from Yasuda et al. and is allowable.

Newly added independent Claim 39 is directed to exposure apparatus that transfers a pattern onto a substrate while moving an element concerning the transfer. In the apparatus, a moving unit moves the element and a control unit controls the moving unit to move the element based on information prepared with respect to each position of the element for correcting an overlay error between first and second patterns during transfer of the second pattern onto the substrate onto which the first pattern has been transferred.

It is a feature of newly added Claim 39 that a moving unit is controlled to move an element of pattern transfer based on information prepared with respect to each position of the element to correct an overlay error between first and second patterns during transfer of the second pattern onto a substrate onto which the first pattern has been transferred. As discussed with respect to Claim 33, Higashiki only teaches preparing correction information for the deformation of a reticle and using the reticle correction information to correct the movement of a pattern transfer element but fails to suggest anything about basing transfer of a second pattern on information for each position of an element of pattern transfer for correcting an overlay error between the second pattern and a previously transferred first pattern.

Jain et al. is limited to teaching moving an element of a pattern transfer based only on the shape characteristics of a substrate obtained by a profiler but is devoid of any suggestion of basing

element movement in the transfer of a second pattern onto a substrate after transfer of a first pattern on information prepared with respect to each position of the element for correcting an overlay error between a first and second pattern.

Yasuda et al. only teaches moving an element of a pattern transfer based on the lateral variations of the mask pattern and distortion of the projection optical system which fails to suggest the feature of Claim 39 of controlling movement of a moving unit to move an element of pattern transfer based on information prepared with respect to each position of the element for correcting an overlay error between first and second patterns during transfer of the second pattern onto the substrate onto which the first pattern has been transferred. Accordingly, it is believed that newly added Claim 39 is completely distinguished from any of Higashiki, Jain et al. and Yasuda et al. and is allowable.

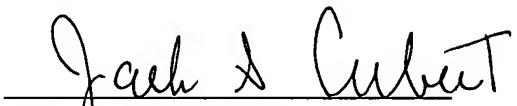
For the foregoing reasons, Applicant submit that the present invention, as recited in independent Claims 16, 31, 33 and 39, is patentably defined over the cited art.

Dependent claims 32, 34-38 and 40-46 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable consideration, withdrawal of the objection and rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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